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None

(58) Field of search

BSN

**Selected US specifications from IPC sub-class
B32B**

(54) **Adhesive laminate having a brittle cover layer**

(57) Method of manufacturing of a multilayer plastic film which has a backing layer an adhesive layer, and a cover layer, which by means of a tool or object inducing pressure exposes the adhesive arranged underneath the cover layer. The three layers, i.e., backing, adhesive and cover layer are coextruded in one step, wherein the layers have preferably the following thicknesses:

backing from 20 microns to 100 microns,
adhesive from 10 microns to 100 microns,
plastic cover layer from 2 microns to 20 microns.

The cover layer consists of a brittle extrudable thermoplast, preferably a brittle-hardening polyethylene or polystyrene.

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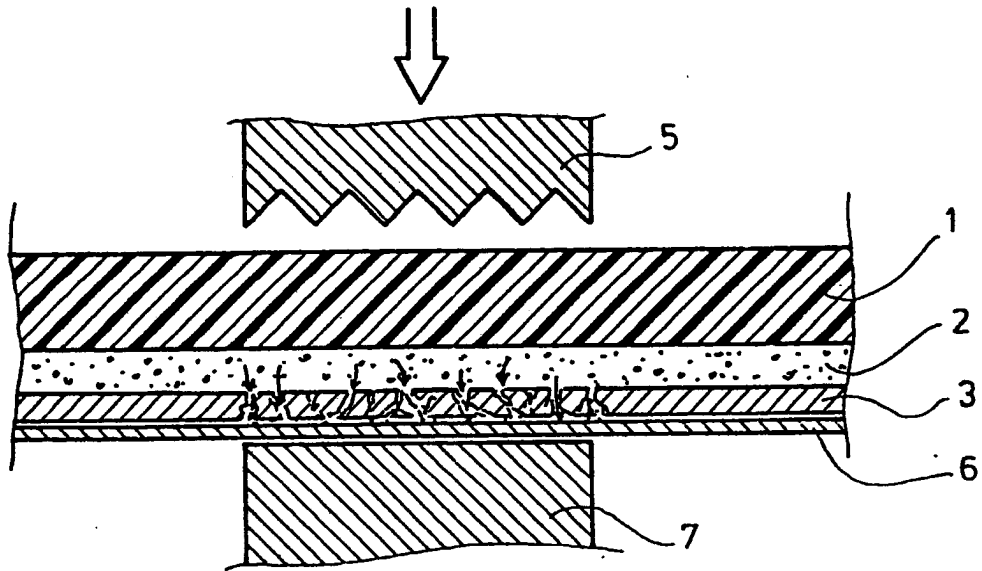


Fig.1

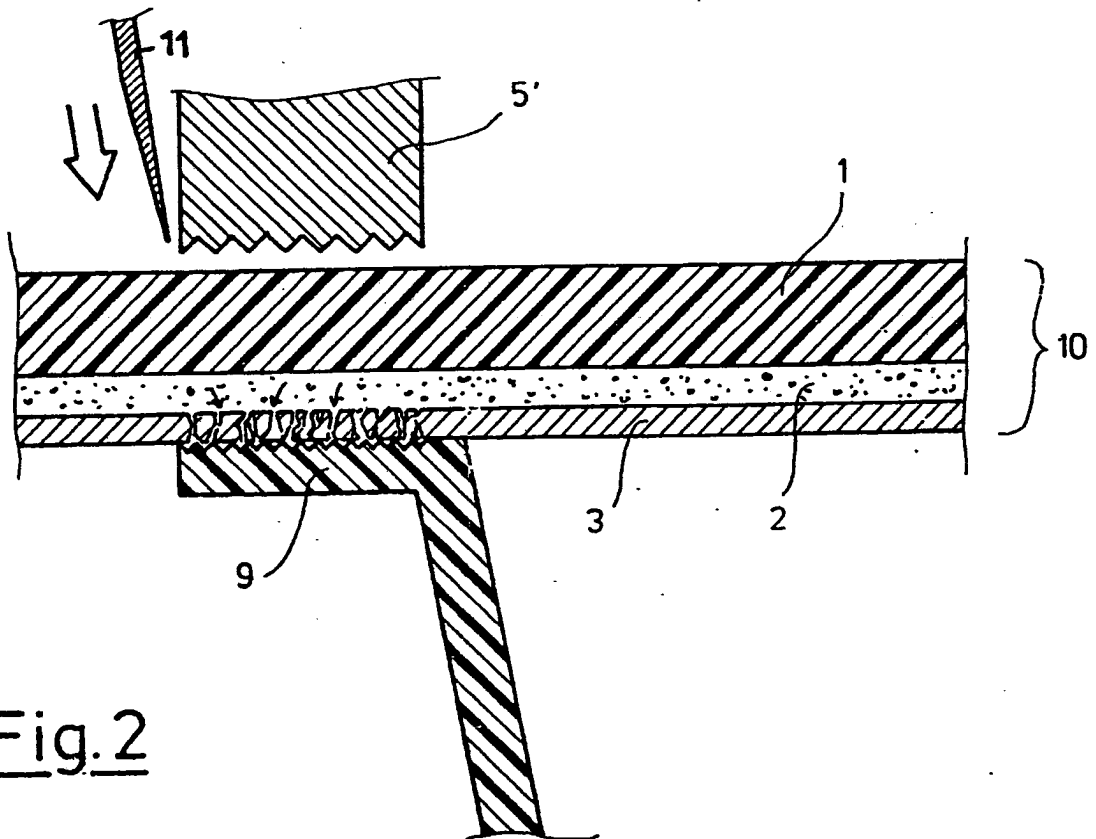


Fig.2

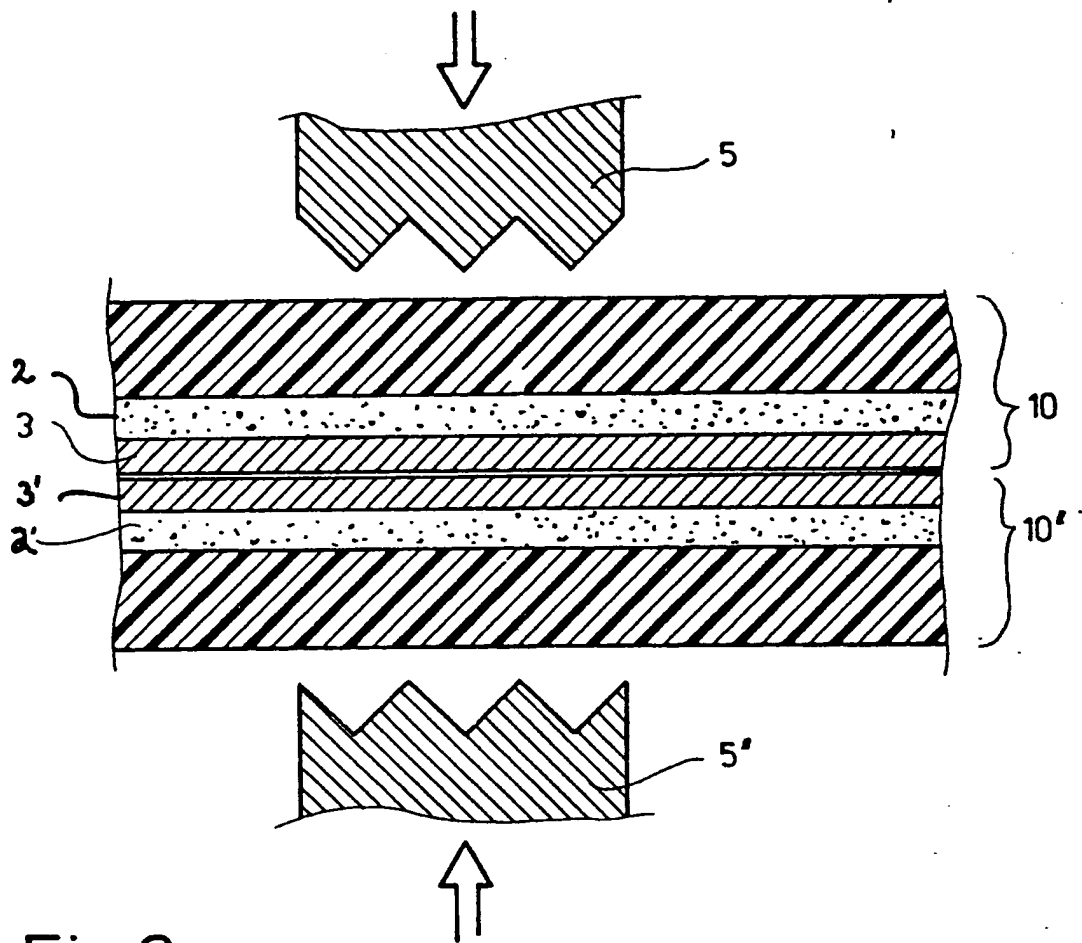


Fig.3

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10 Method of manufacturing of a multilayer plastic film with
 an adhesive coating

15 The invention relates to a method of manufacturing of a
 multilayer plastic film which has a backing and a coating
 applied thereto consisting of adhesive, which coating is
 externally coated with a cover layer which by means of a
 tool or object inducing pressure exposes the adhesive
 arranged underneath the cover layer.

20 German published application (DE-OS) 31 27 205 describes
 a plastic film which is coated on one side with a pres-
 sure sensitive adhesive layer. Said adhesive layer is
 coated with a protective layer which has the property
 that the adhesive penetrates the protective layer by
25 inducing pressure on said protective layer. During in-
 duction of pressure the protective layer shall be de-
 stroyed or pressed aside where the higher pressure is
 effective. Thereby the pressure sensitive adhesive is
 exposed. A low molecular polyethylene (e. g., paraffine),
30 wax or a lacquer consisting of vinylpolymerisates, poly-
 urethane, acrylate or polystyrene is proposed for the
 protective layer. The application thickness of the layer
 should be $0,5 - 50 \text{ g/m}^2$. Referring to a density of 1 this
 results in a calculated thickness between 0.5 to 50
35 microns.

 However, nothing can be derived from said DE-OS 31 27 205

1 for the application of the protective layer. From the
selection of the expression ("thickness of application")
it can be concluded that by means of a spraying process
or by means of roll coating the protective layer is
5 attached to the backing already coated with adhesive.

This method is disadvantageous because a lot of working
steps and waiting periods are needed; an equal and even
coating is very difficult to apply.

10 Therefore it is the object of the invention to describe a
method by which the film mentioned above may be produced
under the conditions of low time consumption, of a high
quality standard and of a minimum of process steps.

15 According to the invention this object is achieved by a
method of manufacturing of the above mentioned multilayer
plastic film in which the three layers, i. e. backing,
adhesive coating and cover layer are coextruded in one
step and wherein the layers have preferably the following
20 thicknesses:

backing	from 20 microns to 100 microns
adhesive coating	from 10 microns to 100 microns
25 plastic cover layer	from 2 microns to 20 microns,

wherein the cover layer consists of a brittle extrudable
thermoplast.

30 The coextrusion is preferably performed by means of a
tubular film extruding machine with a multilayer tool,
which is known by the expert. Said extruding machine
allows the extrusion of several, especially three layers.
In this process several supply channels for the flowable
thermoplastic material are used. One of the channels con-
35 ducts the melted plastic for the backing, the second con-
ducts the adhesive and the third conducts the plastic
which hardens to the brittle cover layer to the die mouth.

1 For the first and the third layer plastics may be used
which cannot be pasted together but permit only to be
connected by the adhesive.

5 The term, "backing", used in the present case, is to be
understood to mean various extrudable thermoplastics as
are known in themselves in the state of the art. In
general they can be polyolefins or olefin copolymers of
various mechanical and chemical properties. It is impor-
10 tant that, in the use of the tool, the backing be not
destroyed, i. e., that it be substantially more elastic
than the brittle cover film.

15 It is to be expressly noted that the backing can serve
only as part of a support layer, e. g., other materials
being duplexed onto the side of the backing opposite the
side of the adhesive coating, such as metal foils, addi-
tional plastic films, paper and the like. In this case
the multilayer plastic film of the invention should be
20 understood only as an "intermediate product."

The term, "tool", refers to corrugated, pointed of edged
means which produce a shearing or pressure stress and
cause the protective film to break up or shatter. "Ob-
25 jects" can also be involved, this term meaning especially
the seat onto which the multilayer film is adhered. What
we have in mind is, for example, flange-like edges of
plastic cups which already bear such corrugation of
waffling that the stress applied to the superimposed
30 multilayer film breaks up the brittle protective film.

The brittle protective film or facing consists of a
brittle extrudable thermoplastics, especially of a
brittle polyethylene or polystyrene.

35 Suitable adhesive coatings are self-stick or pressure-
sensitive adhesives or hot-melt adhesives such as are

1 known in themselves. Self-stick compositions or pressure-
sensitive substances are elastic and permanently tacky
compositions of great adhesive strengths and low cohesive
5 strengths which immediately adhere under only slight
pressure at room temperature to different surfaces. They
are used, for example, for adhesive films and tapes,
self-adhesive labels and the like. In general they are
highly viscous solutions or dispersions of rubber, poly-
acrylates, polyvinyl ethers or polyvinylisobutylene,
10 which are applied to the backing. Examples of hot-melt
adhesives are polyacrylates, ethylvinyl acetate polymers,
or polyesters. The above-named adhesive compositions and
hot-melt adhesives will be selected by the skilled prac-
titioner of the art on the basis of their compatibility
15 with the material of the backing and their coextrudabili-
ty. Such adhesive compositions and pressure-sensitive
adhesives can also be so adjusted that they permit the
removal and reapplication of an article.

20 In the scope of the invention, multilayer sheet materials
can be made using the plastic film. In this case the
multilayer plastic film is adhered after coextrusion to
paper, cardboard, metal foil or other flat materials by
shattering and breaking up the cover layer by means of a
25 tool or object so that the adhesive is exposed.

With the film produced according to the process openings
can be sealed, e. g., the mouths of plastic cups and the
like when such openings are surrounded by a flange-like
margin. The multilayer plastic film produced by coextru-
30 sion is laid onto and is pressed there by means of a tool
so that the brittle plastic protective film is shattered
against the margin and the adhesive emerges. By means of
the adhesive an adhesive bond is produced between the
margin of the opening and the backing. A similar margin
35 seal can be produced by a punching or cutting tool.

1 As stated in the beginning, the pressing and shattering
of the cover layer can also be facilitated by providing
the margin around the opening with a studded texture, or
5 with knurling or other such textures which will destroy
the protective film facing and yield a continuous ring of
adhesive. If a film is used which is equipped with a hot-
melt adhesive, it is heated during the pressing or after
the film has been pressed. Appropriately equipped tools
10 are used for this purpose, such as high-frequency
electrodes.

It is also possible to produce a multilayer sheet mate-
rial by making it to consist of two preferably equal
plastic films laid one on the other at their brittle
15 plastic facing, and bonded together after shattering the
facing.

Embodiments of films and application examples of said
films manufactured according to the invention are
20 represented in the appended drawing, wherein:

Figure 1 is an enlarged representation of a cross section
through part of a multilayer plastic film,

25 Figure 2 shows the application of the plastic film to
seal the mouth of a container,

Figure 3 shows the production of a multilayer flat
article from two plastic films according to the
30 invention.

Figure 1 shows a coextruded plastic film having a backing
1 of polyethylene that is about 50 microns thick, to
which a pressure-sensitive adhesive composition has been
applied as the adhesive coating 2. The outer face of the
35 adhesive coating is covered with a brittle plastic facing
3. The thicknesses of the layers are represented approxi-

1 mately in scale. The brittle plastic facing consists in
the present case of a polyethylene.

5 By means of a tool 5, here represented only diagrammati-
cally, and having a serrated bottom, the film is pressed
against a paper strip 6 under which is a support to
withstand the force of the tool 5. When the tool is
pressed onto the plastic film, the facing 3 shatters and
breaks up, as indicated in Figure 1. The adhesive in the
10 adhesive coating 2 emerges from the shattered openings
and thus makes the paper layer 6 adhere to the backing 1.

15 In Figure 2 another possible application is represented.
Here the mouth 9 of a plastic cup, of polycarbonate for
example, which is not fully shown, is being sealed. This
is accomplished by laying the multilayer plastic film 10
according to the invention, made by coextrusion, on the
lip 9 of the cup. The adhesive layer 2 consists in this
case of a hot-melt glue which is released by heating the
20 adhesive with the tool 5' during or after the pressing on
of the film. The tool is, for example, a high-frequency
electrode. The brittle facing is shattered, as represen-
ted by the broken lines, while simultaneously with the
shattering the hot-melt glue in the adhesive coating 2 is
25 heated and flows out of the shattered areas and cements
the backing 1 to the lip. A cutter 11 then performs a
clean trimming of the overhanging film.

30 In Figure 3 there is shown another possible use of the
plastic film according to the invention in the production
of a multilayer, flat material. Two identical plastic
films 10 and 10' are laid one on the other with their
brittle plastic facings together. By means of compatible
tools 5 and 5' the films are pressed against one another,
shattering the brittle facings 3 and 3' and exposing the
35 adhesive or causing it to emerge in the shattered areas.
This causes the two coextruded materials to adhere to-

1 gether to form a single, multilayer product. The two
plastic films 10 and 10' can also be different, e. g.,
the backings can be of different thicknesses or the
adhesives can be of different composition. The adhesives
5 present in layers 2 and 2' can be adhesives that are
compatible with one another or they can be components
which react with one another.

10 Different substrates such as paper, cardboard or additional plastic films, or even metal foils, or combinations of these materials, can be bonded to the film according to the invention.

15 The backing is preferably polyethylene, e. g., low-density or high-density polyethylene, or it can be a propylene copolymer. Here too the person skilled in the art will be familiar with additional possibilities of configuration, which are susceptible of many variations.

20 For examples of manufacturing of the films according to the invention the following methods of coextrusion are mentioned:

Example 1:

25 By means of an extruder a three layer coextruded film as a coextrudate is made of polyethylene (soft-adjusted) as inner layer and backing, a polyvinylisobutylene-adhesive as middle layer and a polystyrene (brittle-adjusted) as cover layer are coextruded, subsequently cooled and cut
30 open.

Example 2:

35 By means of a tubular film blow extruder or cast film extruder equipped with a three-layer tool a polypropylene (soft-adjusted) as inner layer and posterior backing, a polyacrylate-adhesive as

1 adhesive layer and a polyethylene (brittle-adjusted) as
cover layer are coextruded, subsequently cooled and cut
open.

5 The mentioned examples can be modified for numerous
suitable materials, wherein the manufacturing parameters,
i. e. temperature, amount of fluid, pressure etc., have
to be observed.

10 The films manufactured according to the method can also
be used for manufacture of multilayer plane bodies. For
this purpose, the multilayer plastic-films are pasted
together with paper, paperboard, metal film, plastic
films mono- or biaxial drawn or other plane materials.

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CLAIMS:

1. Method of manufacturing of a multilayer plastic film which has a backing and a coating applied thereto consisting of adhesive, which coating is externally coated with a cover layer which by means of a tool or object inducing pressure exposes the adhesive arranged underneath the cover layer,

characterized in

that the three layers, i.e., backing, adhesive coating and cover layer are coextruded in one step, wherein the layers have preferably the following thicknesses:

backing	from 20 microns to 100 microns,
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adhesive coating	from 10 microns to 100 microns,
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plastic cover layer	from 2 microns to 20 microns,
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and that the cover layer consists of a brittle extrudable thermoplast.

2. Method according to claim 1, characterized in that the brittle-adjusted thermoplast is a brittle-hardening polyethylene or polystyrene.

3. Method according to claim 1, characterized in that the adhesive layer consists of an adherent pressure sensitive composition or of a hot-melt adhesive.

4. Method according to claim 3, characterized in

that the pressure sensitive composition or the hot-melt adhesive is adjusted so that it permits removal and reattachment of an object.

5. Method of manufacturing of a multilayer plane body produced using the multilayer plastic film according to claim 1, characterized in that the multilayer plastic film is adhered to paper, cardboard, metal film, plastic film mono- or biaxial drawn or other plane material.

6. Method according to claim 5, characterized in that the drawn plastic films are metallized or are duplexed with metal film, especially aluminium film.

7. Method of manufacturing of a multilayer plane body produced using the multilayer plastic film according claim 1, characterized in that said body consists of two preferably identical plastic films laid onto one another at the brittle plastic cover layer which films are bonded together after shattering the cover layers.

8. Method according to claim 7, characterized in that the adhesive layers of the films that are used are two reacting components.